
MATERIAL AND METHOD OF FORMING YTTRIA-STABILIZED ZIRCONIA TO MINIMIZE LOW-TEMPERATURE DEGRADATION

ABSTRACT

The invention is directed to an apparatus and a method of substantially eliminating destructive low-temperature, humidity-enhanced phase transformation of yttria-stabilized zirconia in general, as well as eliminating low-temperature degradation of yttria-stabilized tetragonal zirconia polycrystalline ceramic (Y-TZP). The martensitic-type phase transformation from tetragonal to monoclinic is accompanied by severe strength degradation in a moist environment at low-temperature, specifically at room temperature as well as at body temperature. This class of materials has been chosen as the packaging material for small implantable neural-muscular sensors and stimulators because of the high fracture toughness and high mechanical strength. This destructive phase transformation has been substantially eliminated, thus ensuring the safety of long-term implants, by subjecting the sintered components to post-machining hot isostatic pressing, such that the average grain size is less than about 0.5 microns.